-DRAFT- Dissolved Oxygen / Nutrient Strategy in Puget Sound

January 27, 2009

What is Ecology doing right now?

A. South Puget Sound Dissolved Oxygen Study

South Puget Sound has low dissolved oxygen levels. Ecology is conducting a water quality study to help determine how human activities, along with natural factors, affect low dissolved oxygen levels in South Puget Sound. The data report summarizes nitrogen loading information from wastewater treatment plants, rivers, and other sources. The hydrodynamic report will describe how the water moves around; this report will help answer how large of an area different sources potentially influence. The water quality model will tease apart the effect of nitrogen discharges and other factors on dissolved oxygen levels in South Puget Sound. The tools are being developed to provide the technical basis of a TMDL if human contributions cause violations of the State water quality standards. If load reductions are necessary, WQP would lead a TMDL or other process to quantify who reduces what, where, when, and how much.

B. DO Model of Entire Puget Sound

Ecology and PNNL are developing an intermediate-scale model for the entire Puget Sound to understand how system-wide processes affect dissolved oxygen. This project will help determine if current nitrogen loads from point and nonpoint sources into Puget Sound are significantly impacting water quality at a large scale and what level of nutrient reductions would be necessary to reduce or eliminate human impacts to dissolved oxygen levels in sensitive areas. The project was designed to provide rapid answers based on existing information alone, but we will not know how sufficient existing information is until we complete the modeling. Because no data collection was included, modeling will likely indicate that additional effort is necessary to characterize particular processes or specific areas. The alternative to this approach would have been to collect detailed data throughout Puget Sound, which would have been very expensive and would have delayed answers by several years. Ecology also received funding to write a project plan for more detailed work in a new basin, most likely Whidbey Basin. In addition, Ecology is developing a simplified model that conceptualizes Puget Sound as a series of 10 subbasins to characterize the importance of long-term influences like climate cycles, climate change, and coastal upwelling, and how these compare with local human contributions.

C. Technical/Economic Nutrient Removal Analysis

The information generated by this project will show what we could do about nitrogen and phosphorus discharges from municipal WWTPs and roughly what it would cost. It will do this by providing a range of available treatment technologies and associated costs for use by Ecology and local governments when evaluating the technical and economic feasibility of various choices to achieve water quality standards, implementing TMDLs, and meeting wastewater discharge permit requirements.

Project Request for NEP Funding

1. **Initial Investment in South Puget Sound**
    a) **Site-Specific Nitrogen Removal at Wastewater Treatment Plants.** This proposal would support the Technical/Economic Nutrient Removal Analysis by considering site-specific costs for key wastewater treatment plants affecting South Puget Sound. Each facility has a unique process and costs for nitrogen removal can vary significantly based on those site-specific issues. Ecology would work with the facilities to hire contractors to determine the costs of nitrogen removal at the plants. The final list of facilities will be determined later, but would likely two or three facilities out of Shelton, Fort Lewis, Chambers Creek, Tacoma-North, and Tacoma Central.

b) **Outreach**. As the South Puget Sound Dissolved Oxygen Study nears completion, Ecology will need to devote more time to outreach and communication with affected stakeholders. This proposal would fund increased coordination with wastewater treatment plants and local communities. By making the connections between the scientific work and the affected stakeholders, this proposal will position Ecology to successfully implement the South Puget Sound Dissolved Oxygen Study in the future. Ecology will also need to increase coordination with other projects addressing Puget Sound water quality issues.

2. **Independent Third-party Peer Review of South Puget Sound Dissolved Oxygen Study.** High-profile projects benefit from independent third-party review of project approaches and model applications (1) to identify any serious deficiencies that would render results unusable and (2) to reduce the technical work as a source of contention. EPA would manage two national-level peer reviews of the South Puget Sound Study: (1) were the overall approach and methods appropriate and (2) is the dissolved oxygen model application suitable. As for previous complicated TMDL models, Ecology would like to work with EPA to define the specific questions posed to the model reviewers. However, the funding would be direct from EPA to the consultant selected for the review.

3. **South Sound Dissolved Oxygen Model Support for Alternative Management Scenarios.** After Ecology develops a calibrated model of water quality in South Puget Sound, the model will be needed as a tool to refine load reductions and other management scenarios tailored to specific discharges. This proposed project would include funding for an EAP modeler to run alternative management scenarios in close coordination with WQP technical staff. Depending on the findings of the technical study, affected parties may request many model runs that are beyond the scope of the modeling currently underway.

4. **Whidbey Basin Technical Study Initiation**. Whidbey Basin has low dissolved oxygen levels and may be affected by human sources of nitrogen. Whidbey Basin will be the next detailed study area; the project would be similar in structure to the South Puget Sound Dissolve Oxygen Study. The project likely will include a 15-month data collection program and detailed circulation and water quality modeling. This proposed funding would cover only the first three months of data collection. Funding for the remaining data collection and model development has not been identified to date. The project could support a future TMDL or other work to reduce human sources of nitrogen and meet water quality standards for dissolved oxygen.

5. **Watershed-based Follow-up to South Puget Sound Study.** The South Puget Sound Dissolved Oxygen Study focuses on the marine areas and only the mouths of the tributaries to identify which watersheds have the most critical nitrogen loads. This proposed project will investigate innovative approaches to identify nutrient sources in the watersheds and apply nonpoint best management practices efficiently.

Future Work

1. **Scientific Study in the Rest of Puget Sound.** Future work includes completing data collection and modeling in Whidbey Basin. Other next steps will depend on the results of ongoing work. We anticipate continuing to evaluate portions of Puget Sound. Even if a Sound-wide wastewater strategy is adopted, lessons from Budd Inlet indicate that while managing wastewater may be an important step, this may not correct all human-caused contributions to low dissolved oxygen.
2. **Implementation Efforts in South Puget Sound.** Develop and implement nitrogen reduction strategies with wastewater treatment plants and local communities.
3. **Implement recommendations from the Technical/Economic Nutrient Removal Analysis.** Depending on the outcome of the analysis, we may, as appropriate, consider nutrient removal at WWTPs on a broad scale.

	2009				2010				2011 and beyond	Funding
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall		
A. South Puget Sound Dissolved Oxygen Study		Quantified nitrogen loads from rivers and wastewater treatment plants. Human sources can't be ruled out.								Fully Funded (mixture of funds) $1.5 million
• Final Data Report	X									
• Draft Circulation Model Report		X	How does the water circulate? What are the areas influenced by the nitrogen sources?							
• Draft Water Quality Model Report				X	Are humans contributing to low dissolved oxygen levels throughout South Sound?					
• Final Project Report							X	How much do we need to reduce loads to meet water quality standards?		South Sound
B. DO Model of Entire Puget Sound										Fully Funded (NEP Funds) $740,000
• PNNL Water Quality Model Report					X	Are humans contributing to low dissolved oxygen levels in Puget Sound?				
• Ecology Final Project Report							X	What are the contributors? Where do we need to focus next?		Puget Sound
• Write QAPP for Next Basin							X	Write plan for the next detailed DO project.		
C. Technical/ Economic Nutrient Removal Analysis										Fully Funded (NEP Funds) $400,000
• Final Project Report							X	What nitrogen removal technologies are available for WWTPs & what are the costs?		
Decision Point					**Decision Point:** With modeling and technology/economic analysis complete, how do we proceed Sound-wide? TMDL route? Technology route? Both? Other?		*			
Proposed NEP Projects										**Proposed for NEP Funding**
1. Initial Investment in South Puget Sound					What are the site-specific costs for nitrogen removal at key wastewater treatment plants affecting South Puget Sound? Increase outreach and communication with key stakeholders.					$580,000 (2.5 FTEs and contract)
2. Third-party Review of South Sound DO Model						Was the model developed appropriately and is it suitable for use in a regulatory setting?				$50,000-$100,000 (contract)
3. South Sound Model Implementation Support						Run additional "what-if" scenarios on South Puget Sound to support implementation (if source X decreased nitrogen load by 50%, what would be the effect on dissolved oxygen)				$125,000 (1 FTE)
4. *Start* Whidbey Basin Study						*Start* (first 3 months) data collection program designed to ultimately meet dissolved oxygen standards.				$300,000-$500,00 (1 FTE & sampling)
5. Watershed-based Follow-up South Sound						*(Optional)* Identify and address nutrient sources in the watersheds, focused on nonpoint sources.				$200,000 (staff & lab costs)
Future Work in Puget Sound					How much do we need to reduce loads to meet water quality standards in other areas of Puget Sound? Implementation (reduce loads) in South Sound.				X	Not funded.